IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **William H. WARD, Jr.**
Divisional Application of:
Serial No.: **09/356,788** Filing Date: **July 20, 1999**
For: **IMPEDANCE MATCHING NETWORK AND MULTIDIMENSIONAL ELECTROMAGNETIC FIELD COIL FOR A TRANSPONDER INTERROGATOR**

Art Unit: 2632
Examiner: Crosland, D.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Applicant respectfully requests that this Preliminary Amendment be entered prior to calculating the fees for this Divisional Application. Prior to examination on the merits of the above-identified patent application, Applicants respectfully request entry and consideration of the following amendments.

In the Description:

Insert before the first line the following sentence:

--This is a Divisional Application of U.S. Application Serial No. 09/356,788, Filed July 20, 1999, now U.S. Patent No. 6,307,468 issued October 23, 2001. --

In the Claims:

Please cancel claims 1-22 without prejudice. Please add the following new claims 23-41. A clean set of claims 23-41 is also attached hereto.

--23. A radio frequency identification system interrogator, comprising:

a first antenna adapted to generate a first magnetic field component having a first phase;

a second antenna adapted to generate a second magnetic field component having a second phase;

a driver circuit coupled to the first and second antennas to provide at least one signal to cause the generation of first and second magnetic field components; whereby said first and second magnetic fields form a time varying composite magnetic field.

24. The interrogator of claim 23, further comprising a detector for detecting a transponder signal modulated on said magnetic field.

25. The interrogator of Claim 24, further comprising a processor for processing the transponder signal.

26. The interrogator of Claim 23, wherein the first antenna and the second antenna are positioned substantially perpendicular to each other and the first phase magnetic field component and the second phase magnetic field component are in quadrature.

27. The interrogator of Claim 23, further comprising:

a first capacitor having a first end and a second end opposite said first end, said first end of said first capacitor coupled to a first end of said first antenna, said second end of said first capacitor coupled to a second end of said first antenna; and

a second capacitor having a first end and a second end opposite said first end, said first end of said second capacitor coupled to a first end of said second antenna, said second end of said second capacitor coupled to a second end of said second antenna.

28. The interrogator of Claim 24, wherein said detector further comprises a pickup coil positioned perpendicular to both of said first and second antennas.

29. The interrogator of Claim 23, wherein said driver circuit further comprises:

an oscillator adapted to generate a first signal at twice a carrier frequency; and

a phase splitter coupled to said oscillator and adapted to split said first signal into an in-phase component to be provided to said first antenna and a quadrature phase component to be provided to said second antenna.

30. The interrogator of Claim 25, wherein said processor further comprises:

at least one potentiometer coupled to said detector and adapted to nullify interference on said detected signal;

an amplifier coupled to said at least one potentiometer and adapted to amplify said detected signal;

a filter coupled to said amplifier and adapted to filter said detected signal;

a demodulator coupled to said filter and adapted to demodulate said detected signal;

at least one decoder coupled to said demodulator and adapted to decode said demodulated signal; and

a signal processor coupled to said at least one decoder and adapted to process said decoded signal.

31. The interrogator of Claim 25, further comprising a display coupled to said processor, wherein said processor provides said processed signal to said display, said display adapted to display said processed signal in a format understandable by a user.

32. The interrogator of Claim 25, further comprising an audio transducer coupled to said processor, said audio transducer adapted to receive a signal from said processor and produce an audible tone when a transponder is detected.

33. The interrogator of Claim 23, further comprising a third antenna adapted to generate a third magnetic field component, said driver further coupled to said third antenna and driving said third antenna with a first signal to generate said third magnetic field component to process said composite magnetic field.

34. The interrogator of Claim 33, wherein said third antenna is perpendicular to said first and second antenna.

35. The interrogator of Claim 33, further comprising a capacitor having a first end and a second end opposite said first end, said capacitor disposed between said third antenna and said driver, said first end coupled to said driver, and said second end coupled to a first end of said third antenna.

36. The interrogator of Claim 35, further comprising a second capacitor having a first end and a second end opposite said first end, said second capacitor disposed between said capacitor and said third antenna, said first and second end of said second capacitor coupled to a first and second end of said third antenna, respectively.

37. The interrogator of Claim 23 wherein the driver circuit provides a time varying signal to cause said composite magnetic field to rotate.

38. A radio frequency identification system, comprising:

an interrogator having,

a first coil inductor adapted to generate a first magnetic field component having a first phase;

a second coil inductor adapted to generate a second magnetic field component having a second phase, said first coil inductor and said second coil inductor mounted substantially perpendicular to each other and the first phase and the second phase are in quadrature;

means for exciting said first and second magnetic fields at a first frequency for generating a composite magnetic field which rotates;

a passive detector for receiving the electromagnetic signal from said interrogator and transmitting a modulated electromagnetic signal to the interrogator at a second frequency, higher than said first frequency.

39. An interrogator for an identification system, comprising:

a first coil;

a second coil;

a driver coupled to and driving said first coil and said second coil by providing a time varying signal to each of said first and second coils to cause said coils to generate a rotating magnetic field;

a detector for detecting a transponder signal modulated on said rotating magnetic field; and

a processor for processing said transponder signal.

40. The interrogator of Claim 41, wherein said driver further comprises:

an oscillator adapted to generate a first signal at twice a carrier frequency; and

a phase splitter coupled to said oscillator and adapted to split said first signal into an in-phase component to drive said first coil and a quadrature phase component to drive said second coil at said carrier frequency.

41. The interrogator of Claim 41, wherein said processor further comprises:

at least one potentiometer coupled to said detector and adapted to nullify interference on said transponder signal;

an amplifier coupled to said at least one potentiometer and adapted to amplify said transponder signal;

a filter coupled to said amplifier and adapted to filter said transponder signal;

a demodulator coupled to said filter and adapted to demodulate said transponder signal;

at least one decoder coupled to said demodulator and adapted to decode said transponder signal; and

a signal processor coupled to said at least one decoder and adapted to process said transponder signal. --

<u>**Remarks**</u>

Claims 1-22 have been cancelled. Claims 23–41 are now pending in the present divisional application.

Applicants respectfully submit this application is condition for allowance. Early and favorable consideration of the application is respectfully requested.

The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 07-1853 during the pendency of prosecution of this application. Should such additional fees be associated with an extension of time, applicant respectfully requests that this paper be considered a petition therefore. A duplicate of this paper is enclosed for the Deposit Account, should it be needed.

Respectfully submitted,

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October 22, 2001

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CLAIMS

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a second antenna adapted to generate a second magnetic field component having a second phase;

a driver circuit coupled to the first and second antennas to provide at least one signal to cause the generation of first and second magnetic field components; whereby said first and second magnetic fields form a time varying composite magnetic field.

24. The interrogator of claim 23, further comprising a detector for detecting a transponder signal modulated on said magnetic field.

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26. The interrogator of Claim 23, wherein the first antenna and the second antenna are positioned substantially perpendicular to each other and the first phase magnetic field component and the second phase magnetic field component are in quadrature.

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a first capacitor having a first end and a second end opposite said first end, said first end of said first capacitor coupled to a first end of said first antenna, said second end of said first capacitor coupled to a second end of said first antenna; and

a second capacitor having a first end and a second end opposite said first end, said first end of said second capacitor coupled to a first end of said second antenna, said second end of said second capacitor coupled to a second end of said second antenna.

28. The interrogator of Claim 24, wherein said detector further comprises a pickup coil positioned perpendicular to both of said first and second antennas.

29. The interrogator of Claim 23, wherein said driver circuit further comprises:

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a phase splitter coupled to said oscillator and adapted to split said first signal into an in-phase component to be provided to said first antenna and a quadrature phase component to be provided to said second antenna.

30. The interrogator of Claim 25, wherein said processor further comprises:

at least one potentiometer coupled to said detector and adapted to nullify interference on said detected signal;

an amplifier coupled to said at least one potentiometer and adapted to amplify said detected signal;

a filter coupled to said amplifier and adapted to filter said detected signal;

a demodulator coupled to said filter and adapted to demodulate said detected signal;

at least one decoder coupled to said demodulator and adapted to decode said demodulated signal; and

a signal processor coupled to said at least one decoder and adapted to process said decoded signal.

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32. The interrogator of Claim 25, further comprising an audio transducer coupled to said processor, said audio transducer adapted to receive a signal from said processor and produce an audible tone when a transponder is detected.

33. The interrogator of Claim 23, further comprising a third antenna adapted to generate a third magnetic field component, said driver further coupled to said third antenna and driving said third antenna with a first signal to generate said third magnetic field component to process said composite magnetic field.

34. The interrogator of Claim 33, wherein said third antenna is perpendicular to said first and second antenna.

35. The interrogator of Claim 33, further comprising a capacitor having a first end and a second end opposite said first end, said capacitor disposed between said third antenna and said driver, said first end coupled to said driver, and said second end coupled to a first end of said third antenna.

36. The interrogator of Claim 35, further comprising a second capacitor having a first end and a second end opposite said first end, said second capacitor disposed between said capacitor and said third antenna, said first and second end of said second capacitor coupled to a first and second end of said third antenna, respectively.

37. The interrogator of Claim 23 wherein the driver circuit provides a time varying signal to cause said composite magnetic field to rotate.

38. A radio frequency identification system, comprising:

an interrogator having,

a first coil inductor adapted to generate a first magnetic field component having a first phase;

a second coil inductor adapted to generate a second magnetic field component having a second phase, said first coil inductor and said second coil inductor mounted substantially perpendicular to each other and the first phase and the second phase are in quadrature;

means for exciting said first and second magnetic fields at a first frequency for generating a composite magnetic field which rotates;

a passive detector for receiving the electromagnetic signal from said interrogator and transmitting a modulated electromagnetic signal to the interrogator at a second frequency, higher than said first frequency.

39. An interrogator for an identification system, comprising:

a first coil;

a second coil;

a driver coupled to and driving said first coil and said second coil by providing a time varying signal to each of said first and second coils to cause said coils to generate a rotating magnetic field;

a detector for detecting a transponder signal modulated on said rotating magnetic field; and

a processor for processing said transponder signal.

40. The interrogator of Claim 41, wherein said driver further comprises:

an oscillator adapted to generate a first signal at twice a carrier frequency; and

a phase splitter coupled to said oscillator and adapted to split said first signal into an in-phase component to drive said first coil and a quadrature phase component to drive said second coil at said carrier frequency.

41. The interrogator of Claim 41, wherein said processor further comprises:

at least one potentiometer coupled to said detector and adapted to nullify interference on said transponder signal;

an amplifier coupled to said at least one potentiometer and adapted to amplify said transponder signal;

a filter coupled to said amplifier and adapted to filter said transponder signal;

a demodulator coupled to said filter and adapted to demodulate said transponder signal;

at least one decoder coupled to said demodulator and adapted to decode said transponder signal; and

a signal processor coupled to said at least one decoder and adapted to process said transponder signal.